CERTIFICATE

This is to certify that **Dr. C. SHANKAR, M.S.**, Post Graduate student in ophthalmology, Regional Institute of Ophthalmology, Government Ophthalmic Hospital, attached to Madras Medical College, Chennai, carried out this Dissertation titled, **ANALYSIS OF LOW VISION** by himself under my guidance and direct supervision, during the period July 2003 – September 2006. This dissertation is submitted to the Tamil Nadu Dr. MGR Medical University, Chennai in partial fulfillment of the award of M.S Degree in Ophthalmology.

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CONTENTS

PART I

INTRODUCTION

Introduction

Health care roles of the ophthalmologist and optometrist have been enlarged because of changing attitudes towards blind and visually impaired persons.

There are about 45 million visually handicapped people in India. At least 30 millions of them are not totally blind, but partially sighted. Their conditions are neither curable medically nor correctable optically by conventional spectacles, contact lenses, etc. These people find it difficult to carry out their routine work. Low vision aids are useful to a significant number of these people.

In low vision care, no single profession can provide all aspects of treatment. The ophthalmologist, the optometrist, the rehabilitation and orientations and mobility instructor, the counselor and the educator all add parts to the whole form which the patient must select what is most helpful. The number of people who are using low vision aids in this country is quite negligible, perhaps for want of technical know-how, availability of visual aids.

The low vision practice opens a door for a visually impaired to the world of activities through series of optical and non-optical aids and training programmes.

LITERATURE

Literature

A survey of statistics from New York Lighthouse low vision services (1977-1982) indicates that 6755 patients were seen, of whom 55% were not legally blind. 60% were female. The common ocular conditions for low vision were macular degeneration 49%, complicated cataract 16%, glaucoma 11%, diabetic retinopathy 8%, optic atrophy 7%, degenerative myopia 5% and Retinitis pigmentosa 4%. Ninety two percent received an optical aid.

A population-based study was done to assess the prevalence and causes of low vision in a population in Southern India for planning low vision services. Out of 10,293 persons of all ages from 94 clusters representative of the population of Andhra Pradesh, low vision was present in 144 persons. An age, gender, and urban rural distribution adjusted prevalence of 1.05%. The most frequent causes of low vision included retinal diseases (35.2%), amblyopia (25.7%), optic atrophy (14.3%), glaucoma (11.4%), and corneal diseases (8.6%). Multivariate analysis showed that the prevalence of low vision was significantly higher with increasing age, and there was a trend for higher prevalence with decreasing socioeconomic status.

A survey of low vision patients in HonkKong provided some statistical information based on clinical data gathered on low vision patients who attended the low vision clinic of the Hongkong Society for the Blind for the first three years of its operation. In this period, low vision devices were prescribed for 393 patients (46.5% of the sample). The most commonly prescribed LVAs were simple magnifiers and distance telescopes. Cataract was the major cause of low vision.

One hundred and eighty five referred patients with various pathologies were evaluated retrospectively after they had undergone an examination and issued with a prescription for low vision. The majority of patients (77%) benefited from the prescribing of low vision aids. Spectacle mounted magnifiers; high reading additions and telescopes were used as low vision aids. Visual acuity, age, and magnification are important factors on the assessment of low vision aids.

DEFINITION

Definition of Low vision

The Low Vision Treatment process is easier to define than is low vision itself, which escapes concise definition because of variable quantity of impaired sight. WHO study found 65 different definitions for classifying blind around the world. WHO defines low vision patients into various categories:-

Category of impairment	**Best corrected visual acuity (BCVA) in better eye**
0 Normal	6/6 to 6/18
1 Visual impairment	< 6/18 to 6/60
2 Severe visual impairment	<6/60 to 3/60
3 Blind	< 3/60 to 1/60
4 Blind	< 1/60 to only light perception
5 Blind	No light perception
9 Undetermined or unspecified.	

Categories of visual impairment 1 and 2 are referred as low vision, categories 3, 4 and 5 as blindness and category 9 as unqualified visual loss.

Faye defined low vision as bilateral subnormal visual acuity or abnormal visual field resulting from a disorder in visual systems. By definition, the visual acuity cannot be corrected to normal performance level with conventional spectacles, intraocular or contact lens refraction. It is a functional state rather than a mathematical notation.

The low vision patient is a person with an eye disorder whose visual performance is decreased as a consequence of reduced acuity. Abnormal visual field, reduced contrast sensitivity or other ocular dysfunction that prevent performance to full capacity compared to a normal person of the same age and sex.

A person who may have 6/18 or more but has a gross field defect – the field of vision being 20 degree or less is also said to have low vision. The low vision is described as moderate for vision 6/24 – 6/36, severe for 6/60 – 3/60 and profound for 2/60 – 1/60. The correction of low vision is not satisfactory in following conditions when the vision is less than 2/60 or field of vision is less than 10 degrees.

PRINCIPLES OF LOW VISION

Principles of Low Vision Aids

The basic principle of low vision aid is magnification. Low vision patents do not recognize small and far-off targets. The low vision patient who wants to have a clear image of objects has a choice of one or more of three methods of enlarging image.

Relative distance magnification:

The size of retinal image is based on angle-subtended by the object at nodal point of eye. The closer the eye is to the object, the larger the image on the retina. Moving twice as close from a standard viewing distance enlarges that image twofold. A convex lens in spectacle form for use in low vision is an example of relative distance magnification. Stronger the lens, closer the working distance.

Linear magnification:

With linear magnification the object itself is enlarged. Large bold type on books, magazines and closed circuit televisions are examples of linear magnification.

Angular magnification:

Angular magnification is produced by a lens system that is independent of relative distance or linear magnification. Eg. Telescopes that make distance objects appear closer and hand or stand magnifiers so that virtual image appears close to eyes and enlarged.

LOW VISUAL AIDS

Low Vision Aids

A low vision aid is any device that enables the low vision patient to improve his performance.

There are two types of aids:

1. Optical
2. Non-optical

Optical:

A device by virtue of its optical properties raises the level of visual performance. It may be a convex lens, mirror, prisms or electronic device. All of the aids use healthy areas of retina to substitute for damaged areas. No aids can ever replace all of the functions of normal eye. They are prescribed in relation to eye diagnosis, severity of condition, task requirements.

Non-optical aids:

They do not use magnifying lenses to improve visual function.

1) Specific illumination: Improved lighting, reading lamps

2) Light transmission: Absorptive lenses, filters

3) Reflection control: Typo scopes, visors, side shields

4) Enhanced contrast: Colors that improve contrast as in use of black ink on white paper.

5) Linear magnification: Books with large prints.

Non-Visual devices:

They supplement low visual aids when there is profound visual impairment. They are

- Talking calculator
- Talking clocks and watches
- Voice automated printing machines
- Reading machines
- Audio logical equipment

Optical aids:

The bewildering array of optical aids can by readily classified into three major groups

1. Convex lens
2. Telescopic lens
3. Electronic systems

Convex lens:

Monocular and Binocular spectacles:

It is a convex reading lens mounted in a standard full diameter or half-eye frame or attached to the frame as a loupe. It is simple converging system acting on divergent rays from near objects to bring them to zero vergence. The image on retina is enlarged and no accommodation effort is required to focus it,. Monocular spectacle lenses may be prescribed from 1D – 60D. Binocular spectacle lenses may be prescribed from 4 – 12 diopters with base in prisms to aid convergence.

Advantages:

- Most acceptable aid psychologically
- Frees both hands
- Wider field diameter of three convex lens aids

Disadvantages:

- Fixed reading distance
- Fixed optical center – disadvantage in eccentric viewing
- Writing is difficult if stronger than 10D

DISTANCE TELESCOPES

BINOCULAR MONOCULAR TELESCOPES

NEAR VISUAL AIDS

Hand Magnifiers:

They are optically more complex than spectacles. Virtual image produced behaves as if it comes from infinity. One should hold the magnifiers up to the reading material and move the magnifier towards than face until the image fills the lens. Hand magnifiers serve better for spot magnification. A longer focal length lens in useful for myopes. Aspheric lenses provide wider field. The farther the eye from lens, the smaller the field.

Advantages:

Greater working range

Can be used in patients who view eccentrically

Can be used with distance glasses, without glasses or with a bifocal add

Disadvantages:

Reduced field of view

Occupies both hands

It is the lens of choice for patients with constricting field disease and for those who dense central scotomas at direct serving through a spectacle lens.

Stand Magnifiers:

There are two types of stand magnifiers –

Fixed focus stand designed to be used with eye at a distance. Their legs are shorter than the focal length of the lenses. In variable focus stand magnifiers, the distance between lens and reading material can be changed and hence the magnification. In fixed focus stand magnifiers, moderate reading add is required to bring image into focus. In myopes, stand magnifiers of longer wavelength is required.

Advantages:

- Predictable focus with rigid lens material.
- Useful in children who cannot hold magnifiers.
- In specific eye conditions with constricted field.
- In adjustable focus accommodation is not needed.

Disadvantages:

- Reduced field
- Posture is awkward and tiring
- Patients with constricted field and slightly reduced acuity such as Retinitis pigmentosa and glaucoma and patient with tremors are comfortable with these magnifiers.

Distance Telescopes:

It improves resolution of a distant object by enlarging the image, bringing the object closer. There are two types – Galilean and Astronomical.

In Galilean telescope, a convex objective lens is combined with concave ocular lens that produce real, upright image. Concave ocular always have high power.

In Astronomical telescope, objective and ocular are convex lens with internal prisms, which erect inverted image. Field of view is limited by diameter of objective and size of exit pupil

Hand held telescopes are preferred mobility aid whereas spectacle mounted telescope are used for sedentary viewing. Monocular that can be focused from infinity to close reading distance. Least magnification, which is compatible with the task, is prescribed

Advantage:

- Only optical systems that provides magnification for distance.

Disadvantage:

- Reduced field diameter
- Ring scotoma

Intermediate and Near Telescopes:

It is achieved by using a telescope with an intermediate or reading cap over distance unit.

Advantage:

- Adjustable working distance – music, typing

Disadvantages:

- Depth of field is critical.
- Effective field is smaller than comparable spectacle lens

Near telescopes are prescribed for patients who wish to have greatest positive working distance for reading and near work

Patient with less than 5 degrees of central field may not accept telescopic correction for either intermediate or near vision.

When patient cannot use a telescope but requires a greater reading distance that spectacles allow, CCTV should be demonstrated.

Closed Circuit Television:

It is a television camera that relays a magnified image to a monitor screen. The linear magnification of real image is controlled by a zoom lens attached to camera. Magnification up to 60x can be achieved. Reverse polarity is an important feature. Patient who have photophobia or fading of image from intense illumination prefer reverse polarity (White or yellow letters on a black background).

OCUSERT:

Auto focus telescopes of 4x magnification helps to see objects from infinity to 30cm.

Advantages:

- Greater range of magnification 2x – 60x.
- Used binocularly.
- Writing and typing can be done more easily.

Disadvantages:

- Reading speed may be too slow with central scotoma
- Heavy and bulky to carry around.
- Cost factor

Visual Aids for Field Expansion:

Visual aids for field expansion have both advantage and disadvantages. These aids are also called field expanders.

FIELD EXPANDERS

Field expanders have the effect of concave lenses, hence minify target size and reduce visual acuity. The larger the field expansion, lower will be the acuity.

A reverse Galilean system with a positive eyepiece and a negative objective can obtain Field expansion. It can be obtained with a contact lens combined with a spectacle, which is cosmetically superior, but magnification is less than 2x

Door viewer can also be used either as hand held or spectacle mounted. Prisms and mirrors are also used in hemianopic patients. Plane mirror is attached to the rim of the spectacle frame at an angle of 45 degrees on blind scale before left eye for left homonymous hemianopia. Reflected images appear superimposed and laterally reversed on the normal field of view to which the patient should adapt. Similarly prism can be positioned with base in same direction as restricted field. Field of a reversed 2x telescope is twice that of telescope used in conventional direction. Amorphic lens systems can also be used for field expansion.

Prisms as low visual aids:

1. To enlarge binocular vision in nystagmus. Yoked prisms, which move the eyes to null point may be useful to reduce nystagmus.
2. Prismatic magnifiers
3. For field expansion
4. To relocate image by positioning the prisms with base in the direction of normal retina.

NON-OPTICAL DEVICES:

Patients with media opacities may not be able to read comfortably due to glare of reflected, scattered, stray light.

Typoscope help to reduce glare, improve scanning and tracking. It is made by masking light reflected from page except 2-3 lines of point, which is read. Slit can be cut out from non-reflecting matt black, stiff card or plastic sheet. Horizontal length of slit must be greater than horizontal dimension of available visual field.

Pinhole spectacles or pinhole contact lenses are useful in patchy media opacities/corneal opacities. They can be used only in stationary position.

Filters – Tinted glasses:

High intensity light, particularly short wavelength light is harmful to eyes with low vision. If eyes are protected, rate of deterioration on pigmentary degenerative conditions might be retarded. To absorb blue light, they should have red-brown or yellow-orange tint.

Absorptive lenses for patients with low vision should have following properties – absorb UV light preferably below 400nm, cover a wide range of transmission between 80% and 2%, reduce acuity and distort color minimally. Neutral density lenses reduce the amount of light reaching the eye without affecting colour. These lenses are photo chromic and filter out 97-99% of spectral and UV energy below 550nm. They reduce visual acuity and alter color perception. Eg., Corning photo chromic 550 red, 4S photo chromic 511 yellow orange.

Illumination:

Lighting is more important than magnifying aid. Elderly people who constitute a bulk of low vision patients need 50-100% more lighting on account of aging changes.

High illumination is as good as magnification for most low vision subjects. All low vision subjects excepting those central corneal, lenticular opacities require a high illumination. Light sources should be placed on left side of desk for right handed. Light source should be preferably on same side of eye with monocular magnifiers. Incandescent light bulb of 75 watts or more for a working distance of 12-24 cm is desirable.

Recent Innovations:

Low vision enhancement system functions much like a head borne CCTV and can be used for near, intermediate and distance vision tasks. The purpose is to get a damaged retina functioning again by feeding it electrical stimuli, by capturing images by a tiny camera mounted on glasses which modulates the signal from a small, fixed direction laser on the glasses. The laser beam powers the implant and conveys the visual information.

Image remapping is done for central field defect. The print obscured by scotoma is stretched electronically to reappear at scotoma margin. The spectacle-mounted display has miniaturized camera input and the remapper. The patient views the remapped world on the display.

A sightless traveler can use a MOBIC (Mobility Of Blind and elderly people Interacting with Computers). This new device describes, as a techno-map would expand ones potential for traveling in unfamiliar areas

HISTORY AND EXAMINATION OF

LOW VISION PATIENT

History and examination of low vision patient

Low vision history is a series of carefully planned questions revealing to the examiner the person's perception of degree of visual impairment. The clinician should also explain that most low vision aids for reading.

What visual activities do you miss the most, helps the clinician to know what the patient requires most.

The clinician who examines the patient must establish doctor-patient relationship and is the person who should take the history. The essential points in history are:

Visual problem is recent or long term. In recent sight loss, patients often feel obliged to seek further consultation before accepting visual aids. Long-term impairment wants aid immediately

Eye disease, treatment taken earlier should be got from patient. For example- patient on miotic therapy in glaucoma may have prolonged dark adaptation and reduced contrast. Patients with macular degeneration are

excellent candidates for reading aid despite advanced age. General medical or surgical problems affect the ability to use aids.

Mobility of patient outside and inside home should be obtained. The clinician should be considering telescopes for street signs and mobility tracking for insecure traveler. His experience with low vision aids should be got and this can be compared with newer aids available. Patient's preference for daylight or dark helps in prescribing appropriate illumination for daily work.

EXAMINATION

After completion of history, next step in evaluation is to record the distance acuity and to perform conventional refraction.

Distance acuity tests:

Distance acuity is measured to confirm findings of either an over refraction or retinoscopy. The following test cards are recommended because they are specially designed for low vision testing. They are-

Lighthouse distance acuity chart.

Bailey -Lovie chart.

Lighthouse symbol charts and flash cards.

Snellen cards are adequate for testing normal persons, but not for low vision as there are no letters representing acuities between 100 and 200. A chart test does not indicate response to variation in contrast, effect of variable levels of illumination, or effects of field defects on vision.

Visual acuity at 6 meters is not advantageous if visual acuity is less than 20/100. Therefore for these patients visual acuity at 10 feet or closer can be done, since it is the distance at which the patient has become accustomed. Visual acuity can be measured at 10 feet, 5 feet and 3 feet.

Conventional refraction:

1) Visual acuity is measured at 20 feet, 10 feet, 5 feet or 3 feet.
2) Near vision with current glasses should be used using a near vision screening card.
3) Patients with parafoveal fixation should be refracted in the respective visual axis.
4) Anterior segment is checked.

5) If retinoscopic reflex is difficult a pinhole, stenopeic slit or keratometry may be used.
6) An astigmatic error should be corrected only if patient notes subjective improvement with cylinder.
7) If a high add is require for reading, an add of upto +5 diopters may be tolerated for walking about. Where as higher add bifocals are a hindrance because the blur obstructs the lower field.
8) Patients should not have dilated pupils when low vision aids are presented.
9) Conventional and prismatic correction for distance: they should compare their own glasses with any change in refraction discovered during examination. Telescopes improve distance vision by increasing angular magnification. The correction reduces field.

Prisms may occasionally improve vision in pendular nystagmus and may be tried. Bilateral prisms are placed with their bases opposite the direction of eye turn.

Image relocation with prisms:

It may improve distance acuity for macular disease. Image is shifted from fovea to parafoveal location by placing prisms with base in direction of functional retina. A prism of 4, 6 or 8 diopters is kept at appropriate axis and retinoscopy is performed through the prisms and subjective refraction performed. If prisms improve distance acuity they are prescribed binocularly with in 30 degrees of axis to avoid diplopia. Before a prism is prescribed the patient should be reevaluated at a subsequent visit.

Near acuity tests:

After distance acuity has been corrected, evaluation proceeds with testing of near acuity and measuring visual field for location, size and density of scotoma. Tests for near acuity establish the distance in centimeters at which the low vision patients must hold average print and the diopteric power necessary to maintain that distance.

Lists of near acuity tests are:

1) Lighthouse near acuity test- single letters.
2) Sloan- Lighthouse continuous text.
3) Near vision screening cards- GAME card- single words.

Reciprocal of near acuity is basis for calculating the number of diopters of adds needed to read average print (1M, 20/50 Snellen equivalent, Jaeger #5). It is a simple calculation originally used by Kestenbaum.

If patient reads 4M= 40/400

Reciprocal of vision (RV) = 1/ 40 x 400 = 10 diopters.

Snellen - 20/200 acuity

RV = 1/ 20 x 200 = 10 diopters.

The above calculation is obtained by the reciprocal of the distance at which the patient reads the smallest text possible. Before testing near vision the patient must be fully corrected for distance or be emmetropic. If prisms significantly improved distance acuity they should be considered for near vision also. Most of the tests to measure low vision are either single letters or graded text. Graded text measures persons reading skill as well as acuity tests.

Low vision tests are calibrated for 40 cm test distance, which requires a +2.5 D add to compensate for the distance if accommodation is insufficient. Sloan recommends a test card with single letters. Lighthouse

near acuity card has two columns, the patient is asked to read the right column with right eye and the left column with left eye. The end point is the whole line, which the patient reads.

The result is noted, as numerator is 40, the denominator is the print size achieved in meters. Eg. 40/4M indicates a reciprocal of 10 diopters. If near acuity is better than 20/200, record binocular acuity as well and note any improvement over the monocular acuity. Better binocular acuity suggests the possibility of patient using binocular aids. In a test situation text is more difficult to read than single letters. For average near vision requirements of all kinds the minimum add is usually adequate.

Amslers grid:

It is valuable clinical tool for qualitative analysis of macular scotomas, image distortion and contrast perception. It is a good screening test since it is easy to administer and interpret. It is used to identify constricted fields and areas of scotomas, so that prescribing of aids will be made easy.

The patient with best correction and 3 diopters of add is asked to look at the squares of Amsler grid at the recommended test distance of 33 cm and to describe the central area of grid simultaneously. The patient is asked to look at fixation spot. If it disappears the patient has macular lesion. The patient is asked to outline the area of scotoma. It is used to locate the best area of functional retina for image relocation.

If the patient is able to see fixation point and several squares around fixation, the patient will be able to read print with magnification. When patient cannot identify scotomas on an Amsler grid, a tangent screen can also be used to locate scotomas.

PART II

AIM OF THE STUDY

Aim of the study

To analyze 50 cases of low vision patients attending a tertiary government hospital and their acceptance of low visual aids.

To identify the common ocular conditions leading to low vision and to know the visual aids which the patient accept.

MATERIALS AND METHODS

Material and methods

This is a prospective analysis done in Regional Institute of Ophthalmology during the period of January 2005 to December 2005. Fifty patients with low vision who attended the low vision clinic were examined for low visual aids acceptance and improvement of acuity, fields or ability to carry out their daily activities.

Inclusion criteria

1) Patients with best-corrected visual acuity less than 6/18.

2) Patients with visual field less than 20 degrees with normal visual acuity (greater than 6/18).

Exclusion criteria

1) Patients in whom cataract was the cause of reduced acuity.

2) In patients were trauma has caused structural damage to the eye and has reduced his visual acuity.

Patients underwent clinical low vision examination. Data included age, sex, occupation, diagnosis, visual acuity before and after low visual aids prescription and the kind of low visual aids prescribed for distance and near tasks.

After taking the history the following sequence of tests was performed.

1) Measure visual acuity for each eye and improvement with pinhole.
2) Do cover test to know the preferred fixing eye, if monocular units need to be prescribed.
3) Slit lamp examination.
4) Fields are charted with Bjerrums screen, Amslers grid and confrontation.
5) Conventional refraction was done and best-corrected visual acuity was identified.
6) If best-corrected distance visual acuity is less than 6/18 improvement of acuity with distance telescopes was identified and prescribed.
7) Then near vision was tested later and if near vision was found defective magnifiers in the form of spectacles, hand and stand

magnifiers was tried. If the patient did not improve with these magnifiers closed circuit television was used.

Full aperture trial lenses in trial clips should be used in cases of eccentric viewing, nystagmus.

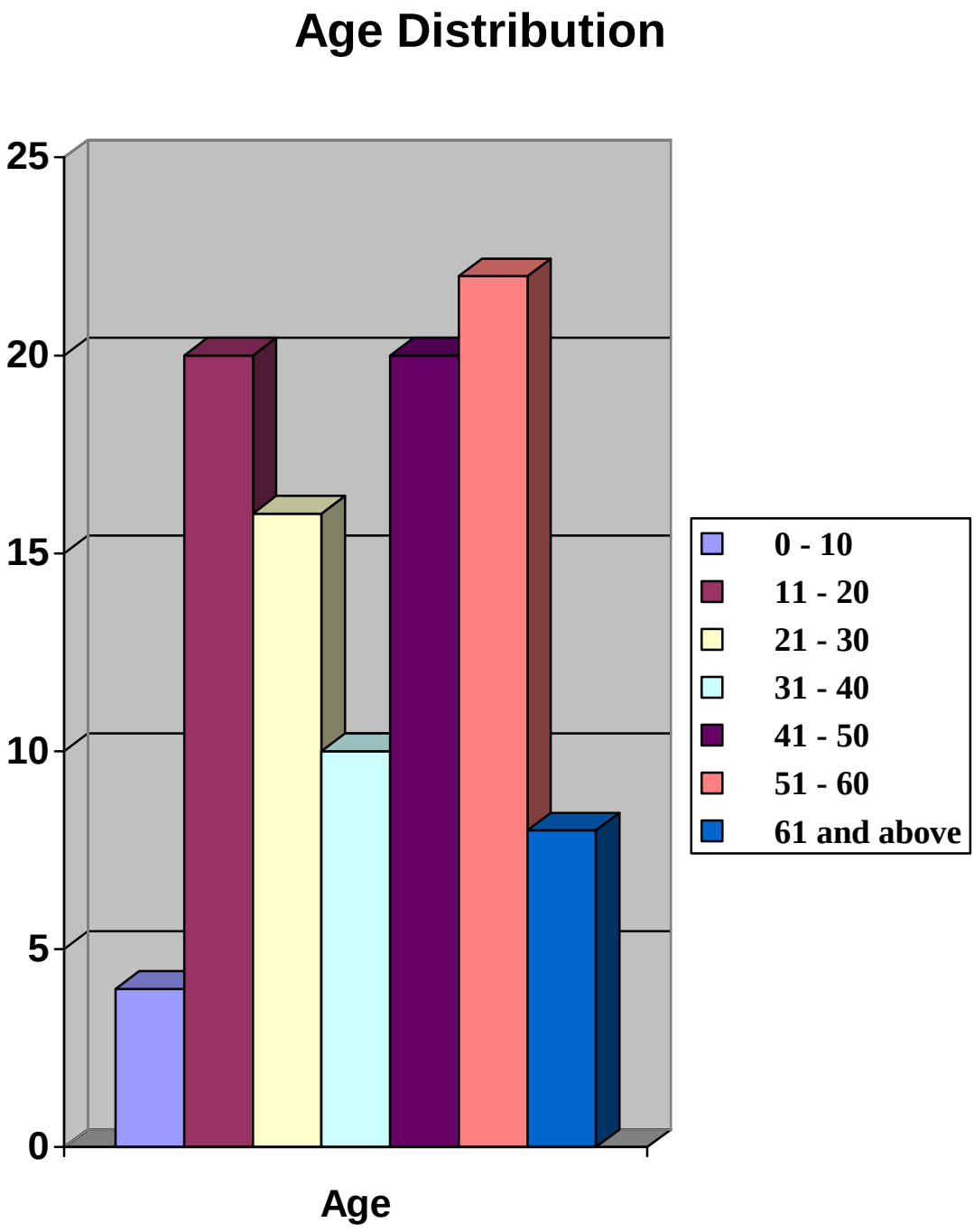
RESULTS

Results

A total of 50 patients were studied for low vision analysis. Males comprised of 72% (36) and female 28% (14). The age distribution showed that maximum number of patient were in the 51-60 years age group 22% (11), 4% (2) were below 10 years and 8% (4) above 60 years. Patients in 10-20 age groups and 40-50 age groups comprised 20% each.

Age distribution

Age group	Percentage
0 - 10	4
11 - 20	20
21 - 30	16
31 - 40	10
41 - 50	20
51 - 60	22
61 and above	8

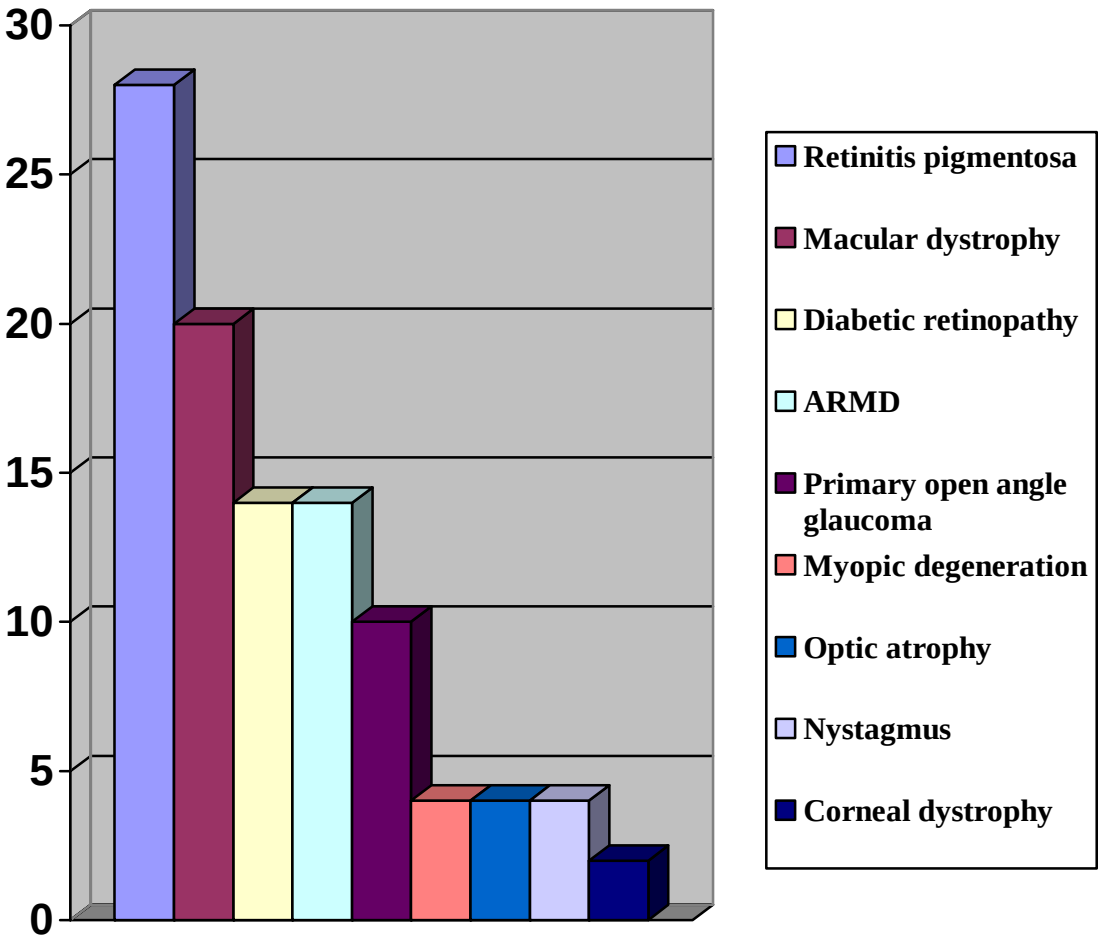

Age Distribution
25
20
15
10
5
0
Age
0 - 10
11 - 20
21 - 30
31 - 40
41 - 50
51 - 60
61 and above

The most common diseases causing low vision were Retinitis pigmentosa (RP) 28% (14), macular pathology 20% (10), diabetic retinopathy 14% (7), and age related macular degeneration (ARMD) 14% (7). Other ocular disorders included primary open angle glaucoma 10%, myopic macular degeneration, optic atrophy and nystagmus 4% each.

Ocular diseases causing low vision

Ocular diseases	Percentage
Retinitis pigmentosa	28
Macular dystrophy	20
Diabetic retinopathy	14
ARMD	14
Primary open angle glaucoma	10
Myopic degeneration	4
Optic atrophy	4
Nystagmus	4
Corneal dystrophy	2

Disease Distribution



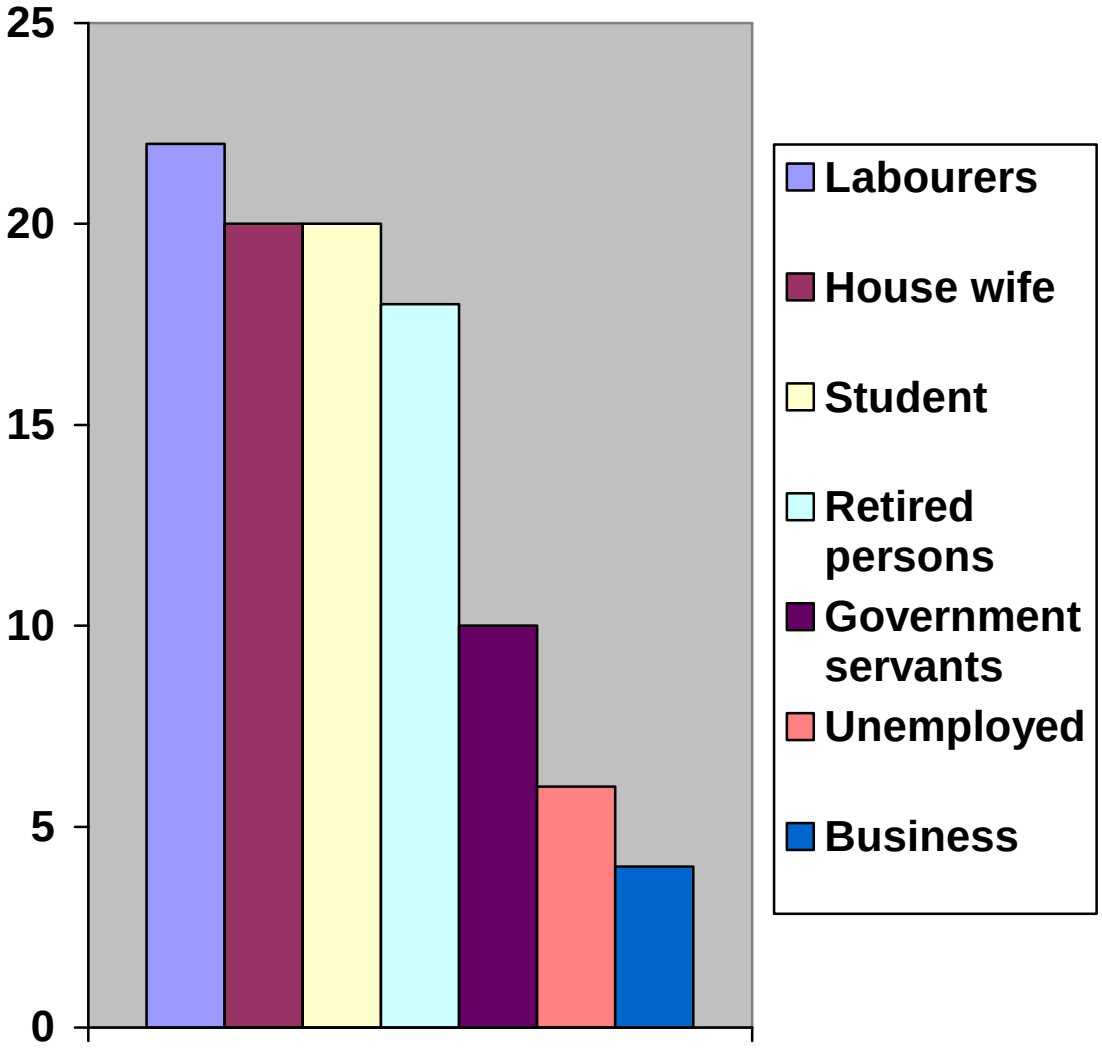
Labourers and house wives were the major number of people who attended the low vision clinic. Labourers accounted for 22%, housewives 20%. Students were the next common group 18% followed by retired persons 18%. 10% were government servants.

Occupation of patients

Occupation	Percentage
Labourers	22
House wife	20
Student	20
Retired persons	18
Government servants	10
Unemployed	6
Business	4

Spectacle magnifiers were most commonly prescribed in 44% of patients followed by telescopes in 38% of patients. Cumulatively distance telescopes were prescribed in 19 patients, field expanders in 13 patients and near visual aids in 43 patients. Some patients improved with both near and distance visual aids but they preferred near magnifier.

Occupational Distribution

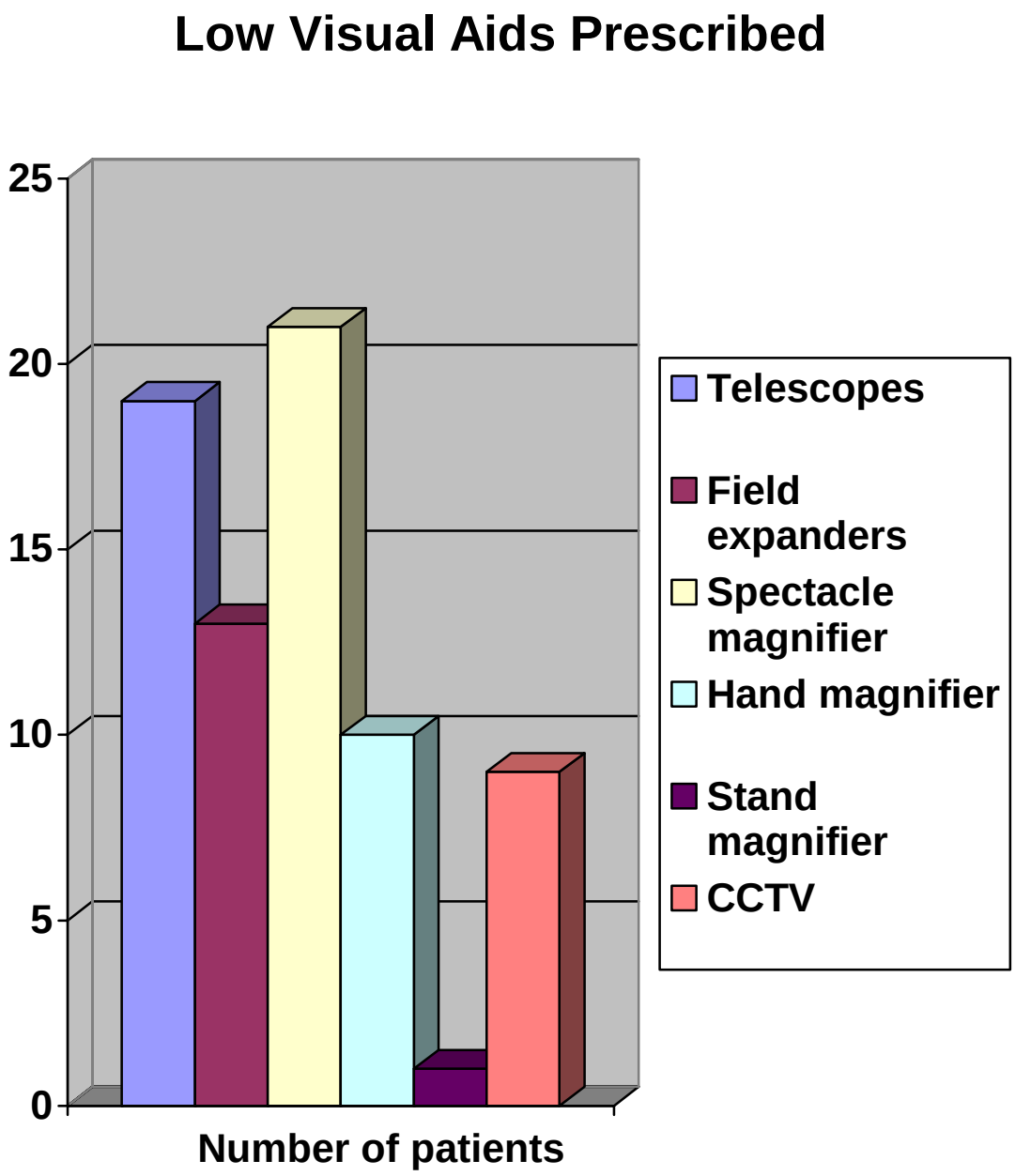


Telescopes were the most commonly prescribed distance visual aid in 38%. For near vision spectacle magnifiers were the most common followed by hand magnifiers in 10 patients and closed circuit television in 9 patients.

Patients who were prescribed distance telescopes had approximately three lines improvement of visual acuity in Snellen's chart. Magnifiers for near vision also improved near vision by three lines. Increased illumination had additive effect on near vision in 20% of patients.

Low visual aids prescribed

Type of aids	Number of patients
Telescopes	19
Field expanders	13
Spectacle magnifier	21
Hand magnifier	10
Stand magnifier	1
CCTV	9


Low Visual Aids Prescribed
25
20
15
10
5
0
Number of patients
Telescopes
Field expanders
Spectacle magnifier
Hand magnifier
Stand magnifier
CCTV

Patients who failed to improve with the available low visual aids were referred to improve daily living skills by orientation and mobility training, sent to rehabilitation center and schools for visually handicapped, and given social counseling. One patient with optic atrophy could not be improved was sent to rehabilitation center.

The choice of visual aids differed in different groups of people. Labourers who were the majority had telescopes (5) and magnifiers (6) prescribed equally. In housewives telescopes were prescribed in 7 patients and magnifiers in 7 patients but most of them preferred magnifiers. In students magnifiers (5) were the most common followed by field expanders in 4 and telescopes in 3 patients. In retired persons magnifiers were the most common in 7 patients and telescopes in 1 patient only. In government servant's magnifiers were prescribed in 3 of the 5 patients.

Occupation	**Distance Telescopes**	**Field Expanders**	**Magnifiers**			**CCTV**
			Spectacle	**Hand**	**Stand**	
Labourers	5	5	1	3	1	3
Housewives	7	1	4	4		2
Students	4	3	4			2
Retired	1		7	2		1
Govt. Servants		2	3			
Unemployed	1	1	2	1		
Business	1	1				1
Total	19	13	21	10	1	9

In relation to ocular diseases, field expanders were prescribed in 11 of 14 patients with Retinitis pigmentosa and the remaining were prescribed magnifiers. In macular diseases telescopes were prescribed in 8, magnifiers in 7 patients and CCTV in 4 patients. In diabetic retinopathy 6 patients were prescribed magnifiers and 3 with telescopes for distant vision. In age related macular degeneration 6 were prescribed magnifiers 2 each with telescopes and CCTV.

Visual aids and disease distribution

Diseases	Distance Telescopes	Field Expanders	Magnifiers			CCTV
			Spectacle	Hand	Stand	
Retinitis pigmentosa	2	11	3	2		1
Macular disease	8		3	3	1	4
Diabetic retinopathy	3		6			1
ARMD	2		6			2
POAG	2	2	1	2		
Nystagmus	1		1			1
Myopia	1					
Optic atrophy			1	2		
Corneal dystrophy				1		
Total	19	13	21	10	1	9

DISCUSSION

DISCUSSION

The study showed that most of patients who came to low vision service were provided with low visual aids which indicates the effectiveness of low vision aids in visual rehabilitation of visually handicapped.

The majority of patients who visited the low vision clinic were males (72%). This may be due to more activities and visual demands in work for males.

Patients under 30 years of age accounted to 40% of the total. They were mostly diagnosed with Retinitis pigmentosa and macular dystrophy. Patients between 30 to 60 years were 52% who are the economically productive people. Patients over 60 years accounted for 8%, this may due to the cause that they become dependent on others. Therefore they are not able to necessary examination done.

In Retinitis pigmentosa field expanders were commonly prescribed in 11 of the 14 patients. Since they reduce the visual acuity patients felt better without them as they are better accustomed to do their tasks by different

head postures. Some with macular involvement in Retinitis pigmentosa did well with magnifiers for near vision. In macular dystrophy, diabetic retinopathy and age related macular degeneration magnifiers in the form of spectacles, hand and stand magnifiers were commonly prescribed. Some improved with telescopes for distance. In patients with extensive scotomas near fixation point, hand and stand magnifiers were better than spectacle magnifiers.

Spectacle magnifiers were the most commonly prescribed low visual aids for near vision in 22 patients. Since spectacles are most commonly seen and cosmetically acceptable, this seems to be the commonly accepted aid. Telescopes were the next common aid accepted by 19 patients and they worked well in sedentary work such as viewing television at fixed distances. Hand magnifiers and strand magnifiers in 12 patients who could not use spectacles since they needed more magnification or had scotomas in central field. Hand magnifiers were difficult in old people with tremors and they had restricted them for short-term use. Closed circuit television were useful in 9 patients who could not be helped with magnifiers, but their cost put them at disadvantage and the patients had to be content with magnifiers.

In housewives magnifiers were commonly accepted, as they felt comfortable with magnifiers at home as their tasks were limited. The same was seen in old people (retired) at home with 7 of the 9 patients preferring magnifiers. Patients in government service also preferred magnifiers. Students experimented with telescopes, field expanders and magnifiers depending on their tasks and requirements. In spite of all these magnifiers were commonly used as near work had preponderance over others.

Patients who could not be helped by Low visual aids, appropriate referral for support services like orientation and mobility training, vocational training, and special education is a must.

Low visual aids help patients make use of remaining vision so that their daily living becomes easier; they enjoy the independence and perform necessary tasks. With the combination of best refractive correction, optical and non-optical aids and electronic devices most visually handicapped people can utilize residual vision effectively to meet their daily visual requirements.

CONCLUSION

CONCLUSION

The study shows that Low visual aids can be prescribed in various ocular diseases, occupation, and age groups according to the patients need.

This study shows the need to establish low vision clinics in government hospitals. This also helps to gather necessary information regarding low vision services.

PART III

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BIBLIOGRAPHY

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PROFORMA

LOW VISION EXAMINATION - PROFORMA

Name: IP / OP No:

Age / sex:

Occupation:

Diagnosis:

History:

1) What kind of difficulty- for distance, near or field.
2) Duration of disability- recent or old.
3) Unilateral or bilateral disability-
4) What can he read? Preference for daylight or dim light and what is his requirement.
5) Can he move independently-
6) Has he used low visual aids before-
7) History of ocular disease and general medical condition-

Ocular examination:

RE **LE**

Unaided vision:……

With pinhole:……

Binocular:…….

Near vision:……..

Binocular:…….

Cover test:…….

Slit lamp:……...

Fields:……

Colour vision:……

Refraction:……

Best-corrected vision:……..

Visual aids:

Distance telescopes:…….

Magnifiers:

Spectacle ……

Hand ……..

Stand …….

Field expanders:……..

Higher illumination:……

CCTV:……..

Final prescription: Visual aid prescribed-

LIST OF SURGERIES PERFORMED

S.NO	NAME	AGE /SEX	IP NO	RE / LE	DIAGNOSIS	SURGERY DONE
1	Dhanam	50/F	380522	LE	MC	ECCE with PI
2	Krishnaveni	45/F	380832	LE	IMC	ECCE with PCIOL
3	Kanaka	60/F	381287	RE	MC	ECCE with PCIOL
4	Govindamma	60/F	382165	LE	MC	ECCE with PCIOL
5	Sabiya Bee	68/F	387815	RE	IMC	ECCE with PCIOL
6	David	20/M	36428	LE	Chalazion	I & C
7	Kuppu	55/F	387219	RE	IMC	ECCE with PCIOL
8	Dhandapani	20/M	42045	LE	Pterygium	Excision
9	Sujatha	21/F	32760	LE	Chalazion	I & C
10	Shanmugam	45/M	44777	LE	Ectropion	Lateral strip done.
11	Ellappan	55/M	389203	LE	Dacryocystitis	DCT done
12	Velu	38/M	390019	LE	Mixed corneal ulcer	TKP done
13	Damodaran	60/M	389132	LE	Bacterial corneal ulcer	TKP done
14	Dhanammal	65/F	382100	RE	IMC	SICS with PCIOL
15	Saraswathy	60/F	400210	LE	IMC	SICS with PCIOL
16	Guna	62/M	400138	RE	IMC	SICS with PCIOL
17	Mahesh	40/M	400102	LE	Limbal tear	Suturing done
18	Selvi	25/F	387148	LE	Dacryocystitis	DCR done
19	Shanmugam	40/M	362520	RE	Retinal detachment	Scleral buckling done
20	Mani	55/M	352180	LE	Panophthalmitis	Evisceration done

KEY TO MASTER CHART

OCC – Occupation-

1- Labourers, 2- Housewives, 3- Student, 4- Retired, 5- Govt. servants, 6- Unemployed, 7- Business.

DIA- Diagnosis-

R.P- Retinitis Pigmentosa, M.D- Macular dystrophy, E.D- corneal endothelial dystrophy, ARMD- age related macular degeneration. D.R- Diabetic retinopathy, OA- Optic atrophy, POAG- Primary Open Angle Glaucoma, NYS- Nystagmus, MYO- Myopic degeneration.

BCVA- Best Corrected Visual Acuity.

TEL- Distance telescopes.

F.E- Field Expanders.

SP.M- Spectacle Magnifiers.

H.M- Hand Magnifiers.

ST.M- Stand Magnifiers.

CCTV- Closed Circuit television.

S.NO	NAME	AGE	SEX	OCC	DIAG	BCVA		NEAR		FIELD	TEL	F.E	MAGNIFIER	
						RE	LE	RE	LE				SP.M	H.M
1	LAKSHMANAN	25	M	1	R.P	6/6	6/6	N6	N6	10		Y		
2	YAMINI	7	F	3	M.D	6/60	6/60	N18	N18		6/18		N8	
3	MYTHEEN	46	M	1	R.P	6/36	6/36	N10	N6	10	6/18	Y		
4	UBADYAI	68	M	4	E.D	4/60	6/18	N18	N12					N10
5	SURESH	20	M	3	R.P	6/36	6/9	N36	N6	15		Y		
6	MURTHY	40	M	1	R.P	2/60	2/60	N36	N36	15		Y	N18	
7	KARTHIK	22	M	3	R.P	6/36	6/60	N18	N36	10	6/24			
8	SANGAVI	8	F	3	NYS	6/36	6/36	N8	N8		6/24			
9	SATHISH	16	M	3	MYO	3/60	3/60	N12	N12		6/60			
10	KUMAR	45	M	1	R.P	6/36	HM	N18		5				N10
11	SELVARAJ	17	M	3	NYS	6/60	6/60	N36	N36				N12	
12	MANI	46	M	6	R.P	6/36	6/36	N36	N36	10		Y	N12	
13	KUMAR	31	M	1	M.D	2/60	5/60	N18	N18		6/60			N12
14	THIYAGARAJ	12	M	3	R.P	1/2/60	1/2/60	N12	N12				N8	
15	PRABAVATHY	26	F	2	M.D	6/60	6/60	N18	N18		6/24		N8	
16	PATHRALAMMA	60	F	2	ARMD	5/60	6/60	N36	N36		6/24		N18	
17	DEVA	25	M	1	NYS	1/60	1/60							
18	RAMAYEE	50	F	2	OA	1/2/60	1/2/60	N36	N36					N18
19	DAS	48	M	7	R.P	6/6	6/6	N6	N6	10		Y		
20	CHELLADURAI	70	M	4	ARMD	2/60	6/24	N18	N18				N8	
21	BALA	78	M	4	ARMD	6/36	1/2/60						N8	
22	SALEEM	12	M	3	M.D	6/36	6/36	N36	N36				N18	
23	MANJUNATHAN	16	M	3	R.P	6/36	6/36	N18	N18			Y		
24	PENCIL REDDY	19	M	1	R.P	6/6	6/6	N6	N6			Y		
25	VENKATRAMAN	20	M	1	R.P	6/18	6/24	N8	N8			Y		
26	JAYAMURTHY	75	M	4	ARMD	6/18	6/24	N36	N36				N18	
27	MANI	45	M	5	POAG	6/6	6/6	N6	N6			Y		
28	MANJULA	35	F	2	R.P	3/60	3/60	N18	N18			Y		N8
29	GUHAN	60	M	4	POAG	6/36	6/36	N12	N12		6/18			N6
30	MANIVELU	28	M	1	M.D	6/60	6/60	N12	N12		6/12			
31	SAMBATH	55	M	5	D.R	6/36	3/60	N18	N36					N12
32	SELVI	60	F	2	POAG	6/18	6/60	N12	N12					
33	ZEENATH BEE	50	F	5	D.R	6/60	5/60	N18	N18					N8
34	DURAI	60	M	4	ARMD	4/60	4/60	N36	N36					N18
35	RANJITH	30	M	6	M.D	4/60	6/60	N18	N36		6/60			
36	PRABHU	30	M	1	OA	3/60	3/60	N36	N36					
37	MANJU	55	F	2	D.R	3/60	3/60	N36	N36		5/60		N18	
38	GURU	45	M	5	POAG	6/6	6/6	N6	N6	15		Y		
39	DURAI	60	M	4	ARMD	6/36	6/36	N18	N18				N12	
40	MUNUSAMY	55	M	4	D.R	6/24	6/36	N12	N12				N8	
41	RANI	15	F	3	R.P	6/6	6/6	N6	N6	15		Y		
42	REVATHY	25	F	2	M.D	4/60	4/60	N18	N36		6/36			
43	DEVANATHAN	55	M	7	ARMD	5/60	5/60	N36	N36		6/24			
44	DANUSH	60	M	4	D.R	6/60	6/60	N18	N36		6/18		N12	
45	KUMARI	35	F	2	M.D	4/60	3/60	N12	N18		6/60			N8
46	ZEENATH BEE	40	F	2	POAG	6/36	6/24	N18	N12		6/12		N8	
47	GOPI	30	M	6	MYO	4/60	6/36	N18	N12				N8	
48	SAMPOORNAM	55	M	5	D.R	6/60	5/60	N36	N18				N12	
49	GOKUL	40	M	1	M.D	4/60	3/60	N36	N36		5/60			

50	BANU	50	F	2	D.R	3/60	3/60	N36			6/60			

S	
ST.M	CCTV
	Y
	Y
	Y
N8	
N6	
N12	
N18	
	Y
	Y
	Y

	Y